NEARCTIC CLICK BEETLES OF THE GENUS AGRIOTES WITH A REORIENTATION OF THE TRIBE AGRIOTINI

BY

EDWARD COULTON BECKER

B.S., University of Missouri, 1944
M.S., University of Illinois, 1950

AN ABSTRACT OF A THESIS

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ACKNOWLEDGEMENTS

I wish to acknowledge my indebtedness to Dr. Herbert H. Ross and Dr. Milton W. Sanderson of the Illinois Natural History Survey, Urbana, Illinois for their continued assistance and advice during this study. Gratitude is also extended to the Illinois Natural History Survey for providing space and equipment necessary for pursuing this work.

Acknowledgements are also due to the following individuals who not only loaned me material, but also gave me valuable advice from time to time: Mr. M. C. Lane, Walla Walla, Washington; Dr. W. J. Brown, Ottawa, Ontario; Dr. W. H. Anderson, U. S. National Museum; and Mr. H. B. Leech, California Academy of Sciences. The officers of the British Museum are thanked for the loan of many exotic species including representatives of the Biologia Centrali-Americana material.

I wish to thank the numerous institutions and individuals who loaned me material for study.

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NEARCTIC CLICK BEETLES OF THE GENUS AGRIOTES WITH A REORIENTATION OF THE TRIBE AGRIOTINI

Agriotes is a medium sized genus in the Elateridae or click beetle family. It contains some 200 species in the world distributed on all continents except Australia, with 30 species occurring in the nearctic region. These include three introduced European species which have become established here, namely *sputator, obscurus,* and *lineatus.*

In the past considerable confusion has resulted in the identification of the adults of *Agriotes.* The previous keys are based on characters which show considerable variation. An attempt has been made to make a useful key to the adults and the known larvae and to adequately illustrate the salient features of each species, especially the male genitalia and the female bursa copulatrix.

Extensive use has been made of the characters provided by the bursa copulatrix, especially the arrangement and shape of the sclerotized plates. These structures have been known for many years, but no use has been made of them as aids to identification or as an aid for studying the phylogeny.

A brief discussion is given on the techniques used, especially that of dissecting out the female reproductive system. The diagnostic characters are discussed with indications where each is most useful.

The larvae of only four native species are associated with the adults, *criddlei, limosus, mancus,* and *sparsus* (unpublished). The larvae of *Agriotes* as now understood are distinguished from those of *Dalopius,* not on the presence of eyespots as has been used in the past, but on the absence of two central dorso-tergal setae on the 9th abdominal segment. *Dalopius* larvae possess these setae. The biology of the native species is lacking. The life history of only *mancus* is known and this is by no means complete.

The nearctic genera of the tribe Agriotini are grouped into two subtribes. The subtribe Adrastina differs from Agriotina by having pectinate tarsal claws. *Glyphonyx* is the only North American genus in Adrastina, but representatives of the palearctic genera of

Silesus and *Adrastus* have also been studied. *Adrastus* retained a simple 4th tarsal segment while *Silesus* and *Glyphonyx* developed a lobed 4th tarsal segment. *Glyphonyx* further specialized by developing two oblique frontal carinae on the head; whereas *Silesus* developed the carinae directed downward as in the typical *Agriotes*.

The subtribe Agriotina contains the nearctic genera of *Dalopius*, *Agriotella*, and *Agriotes*. In Leng's Catalogue *Dalopius* is placed in the tribe Steatoderini. A study of the female reproductive system has shown that this arrangement is invalid, and that *Dalopius* is closely related to *Agriotes* and *Agriotella*. The evidence indicates that *Dalopius* is the most primitive of these genera even though there are some striking changes in the most highly specialized *Dalopius* over those of *Agriotes*. *Dalopius* specialized from the *Agriotes* line by developing a flattened form, straight side margins of the prothorax which join the anterior edge well removed from the unexcavated prosternal sutures, and the larvae developed the two central dorso-tergal setae. On the other hand, *Dalopius* still retains some of the primitive characters as proposed for a hypothetical ancestor of Agriotina, such as the frontal carinae directed toward the meson, prothoracic punctures shallow, umbilicate (navel-like), metathoracic and abdominal punctures noticeably finer than those on the proepisternum, and the peculiar type of plates on the bursa copulatrix. This latter set of characters is also found in the primitive species of *Agriotes* and *Agriotella* (except here the frontal carinae are raised thus producing a carinated front). *Agriotella* possibly evolved from either the *Dalopius* or the *Agriotes* line depending on whether or not the larvae possess the two central dorso-tergal setae. No larvae associated with adults were available for study. In either case *Agriotella* evolved by developing the carinated front.

The genus *Agriotes* is composed of at least four well-defined groups, the *criddlei*, *limosus*, *sputator*, and *sparsus* groups. These groups are characterized mainly by the female reproductive system, but some external characters, the male genitalia, and larval characters support this grouping.

The *criddlei* group is undoubtedly the most primitive group as it retains several characters in common with *Dalopius* and *Agriotella* such as:

1. No accessory gland on female reproductive system.
2. Plates on bursa copulatrix apparently the same as those of *Dalopius* and *Agriotella*.
3. Frontal carinae on head directed toward meson as in *Dalopius*.

There are only two species in the *criddlei* group, both of which are from western North America.

The other groups of *Agriotes* have specialized by developing (1) an accessory gland, (2) various types of plates on the bursa copulatrix, never like those of the *criddlei* group, and (3) by developing the frontal carinae directed downward toward the labrum.

The *limosus* group further specialized by developing:

1. A long slender accessory gland enlarged at the apex.
2. Spermathecal reservoir simple, not branched.
3. Male genitalia with long wide-spread median struts.

The *limosus* group retained affinities with its ancestor in that the proepisternal punctures are noticeably larger than those on the metasternum or abdomen and the retention of rather short colleterial glands. The species included here fall into three complexes, *stabilis*, *torquatus*, and *oblongicollis*, with *apicalis* and *opaculus* unassigned to any complex. Ten exotic species (all from eastern Asia except for one from Europe) have been examined and they belong to this group.

Just when and where the *sputator* group diverged from the *limosus* group is speculation. As yet I have not found any connecting links between these two groups especially in regards to the extremely different female reproductive systems. The female reproductive system is very uniform throughout the *sputator* group. This group specialized by developing:

1. Short sac-like accessory gland, either kidney-shaped or deeply bilobed.
2. Long colleterial glands, about twice as long as bursa copulatrix.
3. Bursa copulatrix with three characteristically shaped plates, although the two smaller ones may be joined.
4. Base of spermathecal reservoir with many coils.
5. Spermathecal reservoir with several branches.
6. Larvae with eyespots on the 9th abdominal segment.

Apparently the nearctic species of the *sputator* group belong in two complexes, the *insanus* complex and the *mancus* complex. Forty-seven exotic species have been examined and should be placed in this group. These exotic species include all of the Central American species examined, all of the European species examined (except one in the *limosus* group), and one species from Japan.

Quite likely the European *acuminatus* (Stephens) represents a connecting link between the *sputator* and the *sparsus* groups. *A. acuminatus* has the typical female reproductive system of the *sputator* group, but it has certain external characters found in the *cylindricus* complex of the *sparsus* group.

The *sparsus* group is probably the most specialized of the groups of *Agriotes* because of the absence of plates on the bursa copulatrix and because the larvae possess eyespots. Other features of the female reproductive system are not known as a satisfactory technique for dissection has not been perfected, neither was there fresh material available. Apparently there are two complexes within the *sparsus* group, the *isabellinus* and the *cylindricus* complexes. As far as known this group is confined to North America.

A key to the groups of *Agriotes* is given as well as a key to the species of each group. The classification of the nearctic *Agriotes* as now understood is given below. The species within the various groups are arranged beginning with the most primitive form. The general distribution of each species is also included. Four new species have been discovered, but until the proposed names for these have been correctly validated, it is not proper to mention them by name. I have included them mainly for completeness and have listed them as *Agriotes* sp.

criddlei group--
  criddlei Van Dyke--Western North America.
  bivittatus Van Dyke--Oregon and California.
limosus group--
  unassigned to complex--
    apicalis LeConte--California to British Columbia.
  stabilis complex--
    quebecensis Brown--Great Lakes region.
    stabilis (LeConte)--Great Lakes region.
    ferrugineipennis (LeConte)-- Pacific Coast region.
    fucosus (LeConte)--Great Lakes region.
    collaris (LeConte)--Northeastern U.S. and Canada.
  torquatus complex--
    tardus Brown--Oregon to British Columbia.
    limosus (LeConte)--Northern U.S. and Canada.
    avulsus (LeConte)--Northeastern U.S. and Canada.
    torquatus LeConte--California.
    theveneti Hom--California to British Columbia.
  oblongicollis complex--
    oblongicollis (Melsheimer)--Eastern U.S. and Canada.
    arcanus Brown--Great Lakes region.
    Agriotes sp.--Western U.S.
  unassigned to complex--
    opaculus (LeConte)--Western U.S.
sputator group--
  insanus complex--
    insanus Candeze--Eastern U.S. to Texas.

mancus complex--
sputator (Linne)--Southeastern Canada.
pubescens Melsheimer--Eastern U.S. and Canada.
obscurus (Linne)--Southeastern Canada.
mancus (Say)--Eastern U.S. and Canada.
lineatus (Linne)--British Columbia and Nova Scotia.
sparsus group--
cylindricus complex--
cylindricus Van Dyke--California.
Agriotes sp.--California.
sparsus LeConte--Oregon to British Columbia.
isabellinus complex--
isabellinus (Melsheimer)--Eastern U.S. and Canada.
Agriotes sp.--Western U.S.
Agriotes sp.-- California.
imperfectus LeConte--California.

Representatives of *porosus* Van Dyke were not available for study. Since, however, Van Dyke compared it with two species now considered as *Dalopius*, there is a possibility that it belongs to *Dalopius*.

Five other species have been described as *Agriotes* and to the best of my knowledge they can be disposed of as follows: *macer* LeConte, *hispidus* LeConte, and *nevadensis* LeConte are all now placed in *Dalopius; protractus* Horn is now placed in *Leptoschema;* and *blaisdelli* Van Dyke is now placed in *Sericus*.

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He was elected to associate membership in Sigma Xi in 1951 and is a member of several entomological societies.